REMARKS

Claims 1-7 are now in this Application, and are presented for the Examiner's consideration.

Claim Interpretation

At the outset, it was stated that a "violet ray hardening apparatus" in claim 9 has been interpreted as the equivalent to an "ultraviolet curing apparatus" which is typically used in the art of drawing and coating optical fibers. However, claim 9 has been canceled.

Rejection of Claims under 35 U.S.C. §112

Claims 7-9 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite.

However, these claims have been canceled from the application.

Accordingly, it is respectfully submitted that the rejection of claims 7-9 under 35 U.S.C. §112 has been rendered moot.

Prior Art Rejections

Claims 1 and 7 were rejected under 35 U.S.C. §102(b) as being anticipated by PCT patent publication no. WO 00/44680 to Yoshida et al. However, it was stated that the Examiner will use U.S. Patent No. 6,519,404, which is the English language

equivalent to WO 00/44680 to explain the rejection.

The present invention relates to an optical fiber drawing apparatus which is capable of minimizing breakage of an optical fiber by adjusting a curvature radius of an optical fiber. This is accomplished by using at least one or more moving rollers and releasing a bending stress and stress concentration, thereby decreasing the possibility of breakage of the optical fiber by adjusting an optical fiber curvature radius. In other words, it is an object of the present invention to adjust an optical fiber curvature radius by using moving rollers so as to not sharply change the optical fiber direction, but rather, to gradually change the direction, as shown in Fig. 3 of the present application.

On the other hand, Yoshida et al relates to a fabrication apparatus for a coated optical fiber which is capable of relieving the elastic torsion remaining in the coated optical fiber to an unproblematic level, even with an increase in the drawing speed during fabrication. In other words, it is an object of Yoshida et al to decrease, prior to be wound up on a winding-up reel, a polarization mode dispersion which is generated in the case of drawing an optical fiber from an optical fiber mother material.

Thus, while the present invention relates to adjusting an optical fiber curvature radius by using moving rollers so as to not

to sharply change the optical fiber direction, Yoshida et al is very different, and only relates to canceling out the elastic torsion of the coated optical fiber in the longitudinal direction.

As clearly shown in Yoshida et al, there is no gradual change in curvature accomplished by at least one or more moving rollers. Rather, all of the changes in direction accomplished with movable rollers are sharp changes in direction.

With the above objects and effects in mind, it will be appreciated that the construction of the present invention is very different from that of Yoshida et al.

Specifically, the present invention comprises an optical fiber drawing apparatus, including a heating furnace adapted to melt an optical fiber mother material and to draw an optical fiber; an optical fiber standard value controller unit adapted to control standard values of the optical fiber drawn; a fixing roller adapted to change a drawing direction of the optical fiber; at least one or more moving rollers which are movable on a drawing surface for adjusting a curvature radius of the optical fiber which has a changed drawing direction; and a winding apparatus adapted to wind the optical fiber which has an adjusted curvature radius.

On the other hand, Yoshida et al comprises a method of fabricating a coated optical fiber by heating to soften an end of

an optical fiber perform to draw a glass fiber out therefrom, laying a coating on the glass fiber to make a coated optical fiber, and guiding the coated optical fiber via a swing guide roller periodically swinging, to twist the coated optical fiber, thereby imparting twists about the axis to the glass fiber inside the coated optical fiber. Yoshida et al includes the step of passing the coated optical fiber which has passed the swing guide roller, through a free zone in which the coated optical fiber is allowed to freely rotate about the axis of the optical fiber, and thereby longitudinally canceling out elastic torsion stored in the coated optical fiber because of longitudinally alternate inversion of twist directions thereof. As a result, a zone length L(m) of the free zone is not less than Lo(m) defined as follows:

Lo(m)=[a maximum drawing speed of the coated optical fiber (m/min)]/[the number of clockwise and counter-clockwise swing motions per unit time of the swing guide roller (motions/min)].

Reference is made between Fig. 3 of the present application and Fig. 3 of Yoshida et al, and between Fig. 4A of the present application and Fig. 4 of Yoshida et al. These comparisons are shown in attached Appendix A hereto, to better show the distinctions.

As shown in the comparative drawings, the most important constituents in the present invention are moving rollers 18 and

19. The moving rollers 18 and 19 are continuously installed <u>immediately after</u> the fixing roller 17, which is provided for changing the direction of the optical fiber 11. Moving rollers 18 and 19 are installed so as to be able to move the position for adjusting a curvature radius of the optical fiber which has a changed drawing direction.

On the other hand, the most important constituent of Yoshida et al is the free zone between take-up unit 26 and winding-up reel 27. The free zone was constructed as a section in which the coated optical fiber was able to travel straight without touching any other member such as the guide roller. Through a free zone, the coated optical fiber 21 is allowed to freely rotate, thereby longitudinally canceling out elastic torsion stored in fiber 21.

Thus, the constructions of both inventions are quite different.

Yoshida et al includes swing guide roller 23 and guide roller 24, which the Examiner equates as the equivalent of moving rollers 18 and 19 and fixing roller 17, respectively, of the present invention. However, swing guide roller 23 and guide roller 24 are well-known. Swing guide roller 23 is a roller in which <u>only the rotation angle θ</u> is changed in the same plane for imparting twists about the axis to the glass fiber inside the coated optical fiber, and guide roller 24 is a roller guiding only the direction. Thus, these rollers differ from moving

rollers 18 and 19 of the present invention, in which the actual positions of these rollers can be changed, rather than just the angular orientation, for adjusting the curvature radius. In other words, axial centers of rollers 18 and 19 are moved to completely different positions, as compared with the axial center of roller 23 of Yoshida et al which stays the same (see Fig. 4 of Yoshida), but only in which the angular orientation of roller 23 changes.

In order to better define the present invention over Yoshida et al, claim 1 has been amended to recite that the fixing roller 17 immediately follows the optical fiber standard value controller unit and is adapted to change a drawing direction of the optical fiber by an angular amount substantially less than 90°. This is clearly shown in Fig. 3 of the present application. This is very different from roller 22 which provides no angular change in direction, roller 24 which provides a sharp 90° change in direction, roller 25 which is far downstream and provides a sharp change in direction, and rollers 3 and 6 which both provide a sharp substantially 90° change in direction.

Further, claim 1 recites that at least one or more moving rollers immediately follow the fixing roller. If roller 23 of Yoshida et al is the claimed moving roller, it does not immediately follow any roller that is adapted to change a drawing direction of the optical fiber by an angular amount substantially

less than 90°. Rather, roller 23 follows roller 22 that provides no change in direction. If rollers 4 and 5 of Yoshida et al are the claimed moving rollers, then these rollers do not immediately follow a roller that is adapted to change a drawing direction of the optical fiber by an angular amount substantially less than 90°. Rather, rollers 4 and 5 immediately follow roller 3 which provides a sharp substantially 90° change in direction.

Claim 1 has been further amended to recite that, as to the at least one or more moving rollers, they are movable so that axial centers thereof are adapted to move to <u>different positions</u> on a drawing surface for <u>gradually</u> adjusting a curvature radius of the optical fiber which has a changed drawing direction <u>in order to release bending stress and stress concentration in the optical fiber and thereby decrease a possibility of breakage of the optical fiber</u>.

Clearly, none of the moving rollers 4, 5 or 23 are adapted to move to different positions to gradually adjust a curvature radius of the optical fiber.

Accordingly, it is respectfully submitted that the rejection of claims 1 and 7 under 35 U.S.C. §102(b) has been overcome.

Claims 2 and 5 were rejected under 35 U.S.C. §103(a) as being obvious from Yoshida et al in view of U.S. Patent No. 4,410,344 to Iyengar, Japanese Patent Publication No.

JP 04-361205 to Komiya et al and U.S. Patent No. 6,324,872 to Blaszyk et al.

The comments made above in regard to Yoshida et al are incorporated herein by reference.

Iyengar was merely cited for disclosing that a bracket is typically used to connect a roller to a device. However, Iyengar fails to cure any of the deficiencies of Yoshida et al.

Japanese Patent Publication No. JP 04-361205 was merely cited for disclosing a movable roller device 9 connected to a bracket such as a base plate 7. However, Japanese Patent Publication No. JP 04-361205 also fails to cure any of the deficiencies of Yoshida et al.

Blaszyk et al was merely cited for disclosing brackets, such as base plates 141 and 142, or yokes 250 and 281, to show that it is known to attach a shaft to a rolling device such as a pulley or a roller. However, Blaszyk also fails to cure any of the deficiencies of Yoshida et al.

Therefore, even if these references are combined with Yoshida et al, the invention of amended claim 1 would still not be disclosed, or even remotely suggested, by such combination.

It is to be further pointed out that claim 5, which depends from claim 2, recites the aspect of the present invention of the moving rollers moving along a drawing surface of the optical fiber, for example, in the vertical direction along slot 21 in

Fig. 4, while claim 5 recites the <u>additional</u> movement of the spin apparatus which impresses a spin to the optical fiber by reciprocating the bracket in a transverse direction with respect to a drawing plane of the optical fiber. None of the cited art discloses or even remotely suggests this <u>combination</u>.

Accordingly, it is respectfully submitted that the rejection of claims 2 and 5 under 35 U.S.C. §103(a), has been overcome.

Claim 6 was rejected under 35 U.S.C. §103(a) as being obvious from Yoshida et al in view of Iyengar, Komiya et al and Blaszyk et al, as applied above, and further in view of Butterworth-Heinemann (Dictionary of Engineering Terms) and Sclater et al (Mechanisms & Mechanical Devices Sourcebook, 2001).

The remarks made above in regard to Yoshida et al, Iyengar, Japanese Patent Publication No. JP 04-361205 and Blaszyk et al, are incorporated herein.

It is not the merely possibility of using a link connected CAM, but rather, of doing so in the claimed combination of claim 5.

In any event, since neither Butterworth-Heinemann nor Sclater et al cure the aforementioned deficiencies of the other references as applied against claim 5, it is respectfully submitted that the rejection of claim 6 under 35 U.S.C. §103(a), has been overcome.

Claims 3 and 4 were rejected under 35 U.S.C. §103(a) as being obvious from Yoshida et al in view of Iyengar, Japanese Patent Publication No. JP 04-361205 and Blaszyk et al, and further in view of Sclater et al, all as cited above.

The remarks made above in regard to Yoshida et al, Iyengar, Japanese Patent Publication No. JP 04-361205, Blaszyk et al and Sclater et al, are incorporated herein.

Claim 4 recites the combination of Fig. 4 in which the movable roller 18 is vertically translatable (claim 3), as well as being pivotable (claim 4). This combination is nowhere disclosed or even remotely suggested by the cited references.

Accordingly, for the same reasons given above in regard to claim 5, it is respectfully submitted that the rejection of claims 3 and 4 under 35 U.S.C. §103(a), has been overcome.

Claim 8 was rejected under 35 U.S.C. §103(a) as being obvious from Yoshida et al as applied above, and further in view of U.S. Patent No. 6,055,830 to Do.

However, since claim 8 has been canceled, it is respectfully submitted that the rejection of claim 8 under 35 U.S.C. §103(a), has been rendered moot.

Claim 9 was rejected under 35 U.S.C. §103(a) as being obvious from Yoshida et al as applied above, and further in view of U.S. Patent No. 6,371,394 to Roba.

However, since claim 8 has been canceled, it is respectfully submitted that the rejection of claim 8 under 35 U.S.C. §103(a), has been rendered moot.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

In the event that this Paper is late filed, and the necessary petition for extension of time is not filed concurrently herewith, please consider this as a Petition for the requisite extension of time, and to the extent not tendered by check attached hereto, authorization to charge the extension fee, or any other fee required in connection with this Paper, to Account No. 07-1524.

The Commissioner is authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1524.

In view of the foregoing amendments and remarks, it is

respectfully submitted that Claims 1-7 are allowable, and early and favorable consideration thereof is solicited.

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